Advanced Information Systems Technology

Global Flood Risk From Advanced Modeling and Remote Sensing in Collaboration With Google Earth Engine

Completed Technology Project (2015 - 2017)

Project Introduction

As predictive accuracy of the climate response to greenhouse emissions improves, measurements of sea level rise are being coupled with modeling to better understand coastal vulnerability to flooding. Predictions of rising intensity of storm rainfall and larger tropical storms also imply increased inland flooding, and many studies conclude this is already occurring in some regions. Most rivers experience some flooding each year: the seasonal discharge variation from low to high water can be 2-3 orders of magnitude. The mean annual flood is an important threshold: its level separates land flooded each year from land only affected by large floods. We lack adequate geospatial information on a global basis defining floodplains within the mean annual flood limit and the higher lands still subject to significant risk (e.g. with exceedance probability of greater than 3.3%; the 30 yr floodplain). This lack of knowledge concerning changing surface water affects many disciplines and remote sensing data sets, where, quite commonly, a static water 'mask' is employed to separate water from land. For example, inland bio-geochemical cycling of C and N is affected by flooding, but floodplain areas are not well constrained. Measurements and computer models of flood inundation over large areas have been difficult to incorporate because of a scarcity of observations in compatible formats, and a lack of the detailed boundary conditions, in particular floodplain topography, required to run hydrodynamic models. However, the available data now allow such work, and the computational techniques needed to ingest such information are ready for development. Optical and SAR sensing are providing a near-global record of floodplain inundation, and passive microwave radiometry is producing a calibrated record of flood-associated discharge values, 1998-present. Also, global topographic data are of increasingly fine resolution, and techniques have been developed to facilitate their incorporation into modeling. Several of us have already demonstrated the new capability to accurately model and map floodplains on a continent scale using input discharges of various sizes and exceedance probabilities. Work is needed to accomplish global-scale products, wherein results are extended to all continents, and downscaled to be locally accurate and useful. Floodplain mapping technologies and standards vary greatly among nations (many nations have neither): the planned effort will provide a global flood hazard infrastructure on which detailed local risk assessment can build. Our project brings together an experienced team of modeling, remote sensing, hydrology, and information technology scientists at JPL and the University of Colorado with the Google Earth Engine team to implement and disseminate a Global Floodplains and Flood Risk digital map product. This project addresses major priorities listed in the AIST program: with Google, we would identify, develop, and demonstrate advanced information system technologies that increases the accessibility and utility of NASA science data and enables new information products. The work will address the Core Topic 'Data-Centric Technologies', including 'Technologies that provide opportunities for more efficient interoperations with observations data systems, such as high end computing and modeling systems; and

Image Not Available

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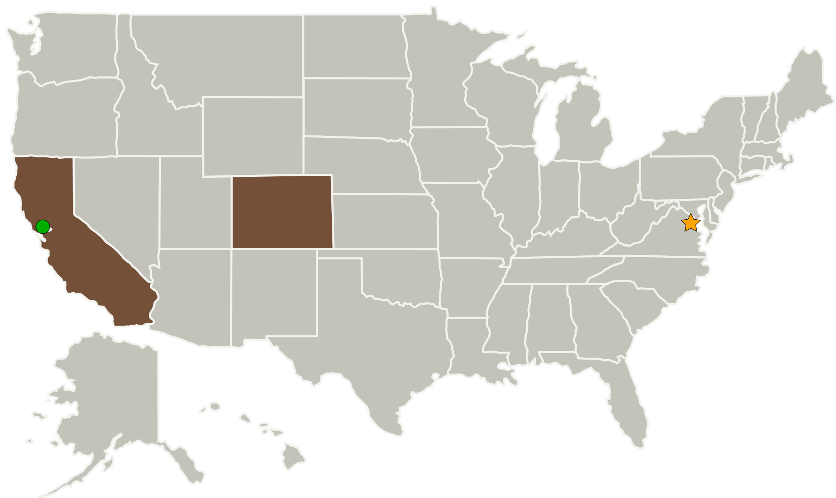
Capabilities that advance integrated Earth science missions by enabling discovery and access to Service Oriented Architecture'. It will also address the Special Subtopic 'Technology Enhancements for Applied Sciences Applications' in regard to natural disasters, and contribute to the GEOSS architecture for the use of remote sensing products in disaster management and risk assessment.

Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
NASA Headquarters(HQ)	Lead Organization	NASA Center	Washington, District of Columbia
Ames Research Center(ARC)	Supporting Organization	NASA Center	Moffett Field, California
University of Colorado Boulder	Supporting Organization	Academia	Boulder, Colorado

Primary U.S. Work Locations	
California	Colorado

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Lead Center / Facility:

NASA Headquarters (HQ)

Responsible Program:

Advanced Information Systems Technology

Project Management

Program Director:

Pamela S Millar

Program Manager:

Jacqueline J Le Moigne

Principal Investigator:

Robert Brakenridge

Co-Investigators:

Albert J Kettner
Konstantinos Andreadis
Chandra Tjandrasa
Paul D Bates
Guy J Schumann

Technology Maturity (TRL)

Start: **3**
Current: **3**

1 2 3 4 5 6 7 8 9

Applied Research | Development | Demo & Test

Technology Areas

Primary:

- TX11 Software, Modeling, Simulation, and Information Processing
  └ TX11.2 Modeling
    └ TX11.2.4 Science Modeling

Target Destination

Earth